

What is claimed is:

1. An silicon-on-insulator (SOI) substrate, comprising:
a silicon substrate including an active region defined by a field region, the field region
5 including:
a first oxygen-ion-injected isolation region having a first thickness and being
formed under said active region, a center of said first region being at a first depth from a top
surface of said silicon substrate; and
a second oxygen-ion-injected isolation region having a second thickness
10 greater than said first thickness, said second region being formed at sides of the active region
and formed from a top surface of said silicon substrate, a center of the second region being at
a second depth from the top surface of said silicon substrate,
wherein the first and second regions surround the active region for device isolation.
2. An SOI substrate as claimed in claim 1, wherein a top surface of said active
region and the top surface of said second ion injected isolation region are co-planar.
3. An SOI substrate as claimed in claim 1, wherein said first depth and said
second depth are substantially the same.
- 20 4. An SOI substrate as claimed in claim 1, wherein said first depth and said
second depth are in a range of about 0.07-0.7 μ m.
5. An SOI substrate as claimed in claim 1, wherein said second thickness is about
25 2-3.5 times the first thickness.
6. An SOI substrate as claimed in claim 1, wherein said first thickness is about
0.04-0.6 μ m, and said second thickness is about 0.14-1.4 μ m.
- 30 7. A method for manufacturing an SOI substrate, comprising:
forming a sacrificial blocking layer pattern on a silicon substrate, the sacrificial
blocking layer pattern defining an active region;

introducing first oxygen ions at a first energy and at a first dose into a surface of said silicon substrate on which said sacrificial pattern is formed, thereby forming a first oxygen-ion-injected region in said silicon substrate; and

introducing second oxygen ions at a second energy and a second dose, thereby
5 forming a second oxygen-ion-injected region in an upper portion of the silicon substrate uncovered by said sacrificial blocking layer pattern, the second energy and the second dose each being less than the first energy and the first dose, respectively,

wherein said first and second oxygen-ion-injected regions forms a field region that surrounds and isolates the active region.

10 8. A method of manufacturing an SOI substrate as claimed in claim 7, wherein the first oxygen ion injected region is of a belt-shape or of a stepped bell shape.

9. A method of manufacturing an SOI substrate as claimed in claim 7, wherein
15 said first oxygen ion injecting process is implemented with 32O_2^+ , with an energy range of about 60-80KeV and with the first dose of about 1×10^{18} - $8 \times 10^{18} \text{cm}^{-2}$.

10. A method of manufacturing an SOI substrate as claimed in claim 7, wherein
20 said second oxygen ion injecting process is implemented with 32O_2^+ , with an energy range of less than 20KeV and with the second dose of about 1×10^{18} - $8 \times 10^{18} \text{cm}^{-2}$.

11. A method of manufacturing an SOI substrate as claimed in claim 7, further comprising:

removing said sacrificial blocking layer pattern; and

25 forming an insulating layer by oxidizing said first and second oxygen-ion-injected regions through a heat treatment of said substrate.

12. A method of manufacturing an SOI substrate as claimed in claim 11, wherein
30 said heat treatment is implemented at a temperature range of about 1100-1300°C for about 2-7 hours using an oxidizing ambient.

13. A method of manufacturing an SOI substrate as claimed in claim 12, wherein said oxidizing atmosphere is a gas mixture including argon and oxygen.

14. A method of manufacturing an SOI substrate as claimed in claim 7, wherein said sacrificial blocking layer pattern is one selected from the group consisting of a photoresist pattern, a polyimide layer pattern and an SOG (spin-on-glass) layer pattern.

5 15. A method of manufacturing an SOI substrate as claimed in claim 7, wherein said sacrificial layer is formed to a predetermined thickness such that oxygen ions pass through said sacrificial blocking layer pattern during the introduction of said first oxygen ions, while oxygen ions could not pass through said sacrificial blocking layer pattern during the introduction of said second oxygen ions.

10 16. A method of manufacturing an SOI substrate as claimed in claim 7, wherein a thickness of said sacrificial layer is approximately 0.05-0.5 μ m.

15 17. A method of manufacturing an SOI substrate as claimed in claim 7, wherein an ion injecting angle is 0° during the introduction of said first and second oxygen ions.

20 18. A method of manufacturing an SOI substrate as claimed in claim 7, wherein the introduction of the first oxygen ions and the introduction of the second oxygen ions are sequential.